Salinity/Hydrodynamic/Water Quality and Sediment Modeling for Currituck Sound Feasibility Study

- Goal:
  - Characterize existing hydrologic and water quality conditions in Currituck Sound and to use models to investigate options for improving water quality and living resources in the Sound.

Salinity/Hydrodynamic/Water Quality and Sediment Modeling for Currituck Sound Feasibility Study

- Objective:
  - Characterize the effects of internal and external factors (freshwater flow, tides, wind, suspended and bottom sediments, nutrient inputs, land use, etc.) on water quality and the health of the biological communities in Currituck Sound

Salinity/Hydrodynamic/Water Quality and Sediment Modeling for Currituck Sound Feasibility Study

- Teams:
  - Modeling Group
    - Develop numerical model
    - Calibrate
    - Verify
  - Data Collection Group
    - Supports modeling effort by providing data

- USGS
  - Sites 4, 5, 6, 20 and 24
    - Discharge, flow, and level
- ECSU
  - Sites 4, 5, 6, 15 and 20
    - In situ water monitoring
    - Water sample collection
- NCNERR
  - Sites 14, 23 and 24
    - In situ water monitoring
- USACE FRF Duck
  - Site 17
    - Water level
- US Fish and Wildlife
  - Site 21
    - Water sample collection
- VADEQ
  - Sites 1 and 2
    - Existing monitoring

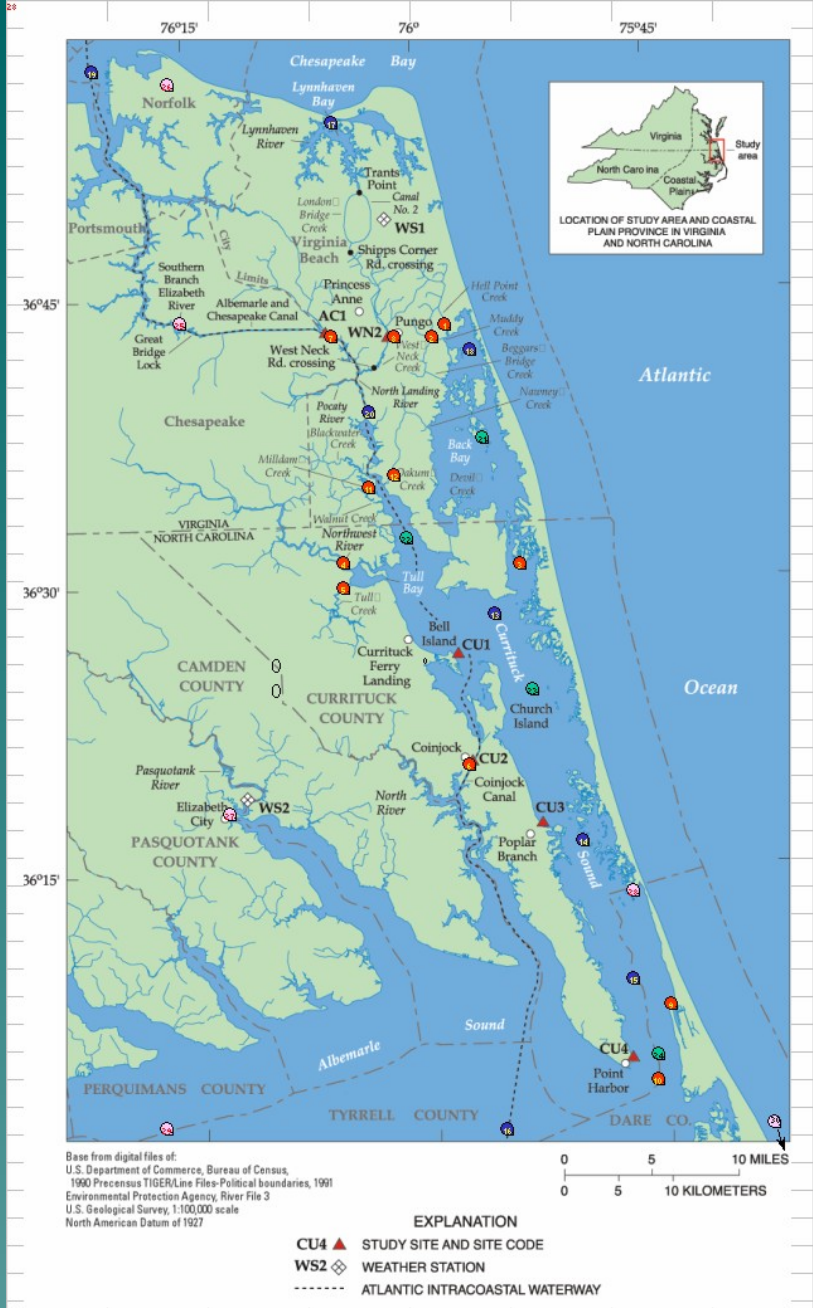


Figure - 1 SITE MAP

ECSU and NCNERR Participation and Accomplishments To Date

- Objective: In-situ, near continuous water property monitoring at five sites
- Progress To Date:
  - Have four YSI 6600 instruments in hand and calibrated (two EDS with vented cable); student trained in calibration and setup
  - Conducted week-long trial of one instrument near Brumsey Road in Coinjock
  - Have four deployment tubes in hand
  - Designed attachment device for deployment tubes
  - Selected deployment locations in conjunction with USGS

ECSU and NCNERR Participation and Accomplishments To Date

Plans: In December 2005:

- Deploy two YSI 6600 at two sites (Coinjock and Tulls Bay) with weekly exchange of instruments, maintenance and data download
- Order two additional YSI 6600 EDS with vented cable and calibrate
- Train research technician

In January 2006:

Deploy at four sites by rotating instruments two at a time

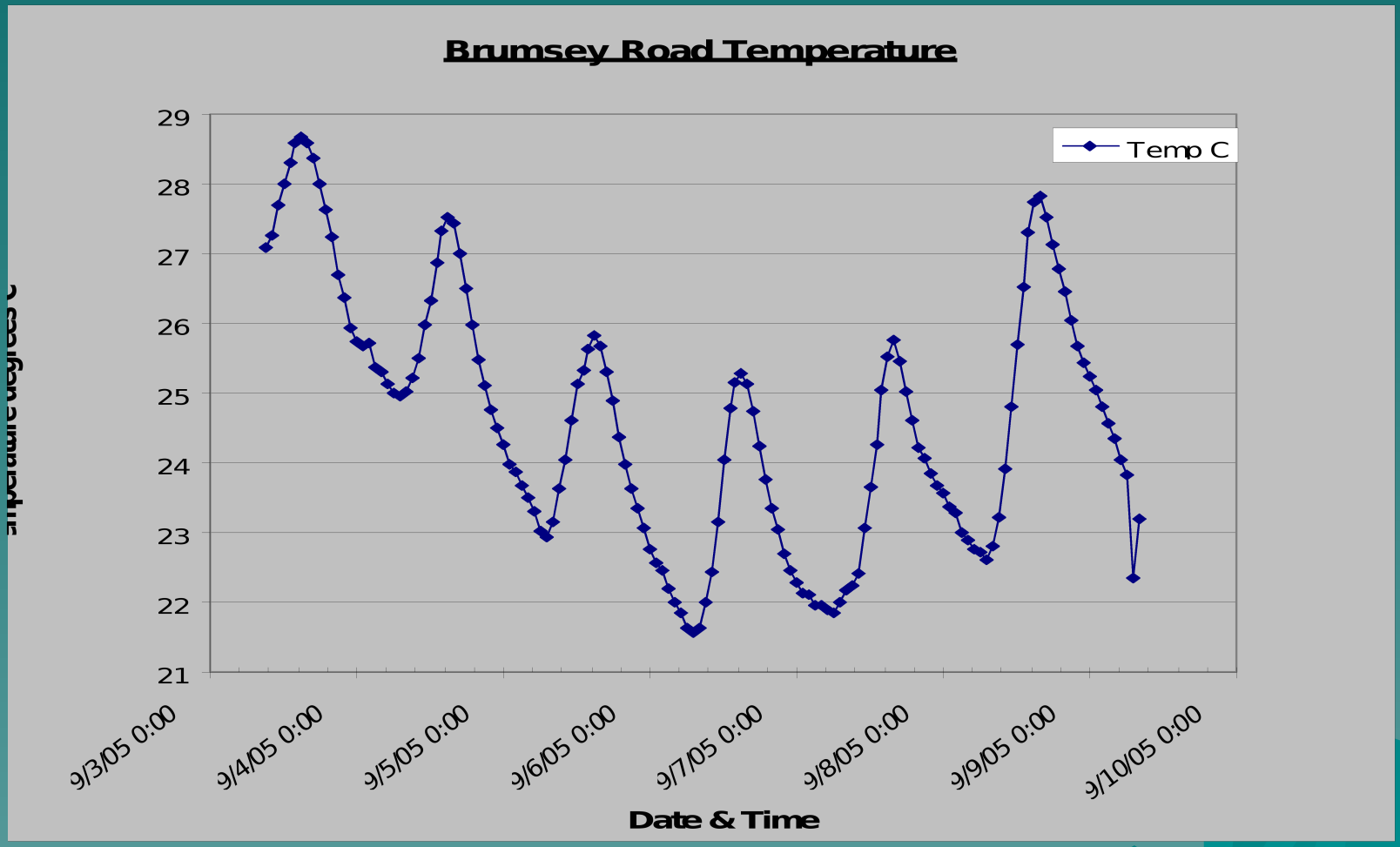
ECSU and NCNERR Participation and Accomplishments To Date

- Weekly collection of water samples at five sites for lab analysis:
  - To begin when funds available
- Weekly water property monitoring at sites using handheld instruments:
  - Will begin in January 2006
  - Have collected almost one year of data at six additional sites on western side of Currituck Sound; will continue this effort
- Sediment grains size and organic content analyses:
  - Have completed 8 samples; will continue with samples as they are collected along SAV transects
  - Includes partitioning of sand fraction into five size classes

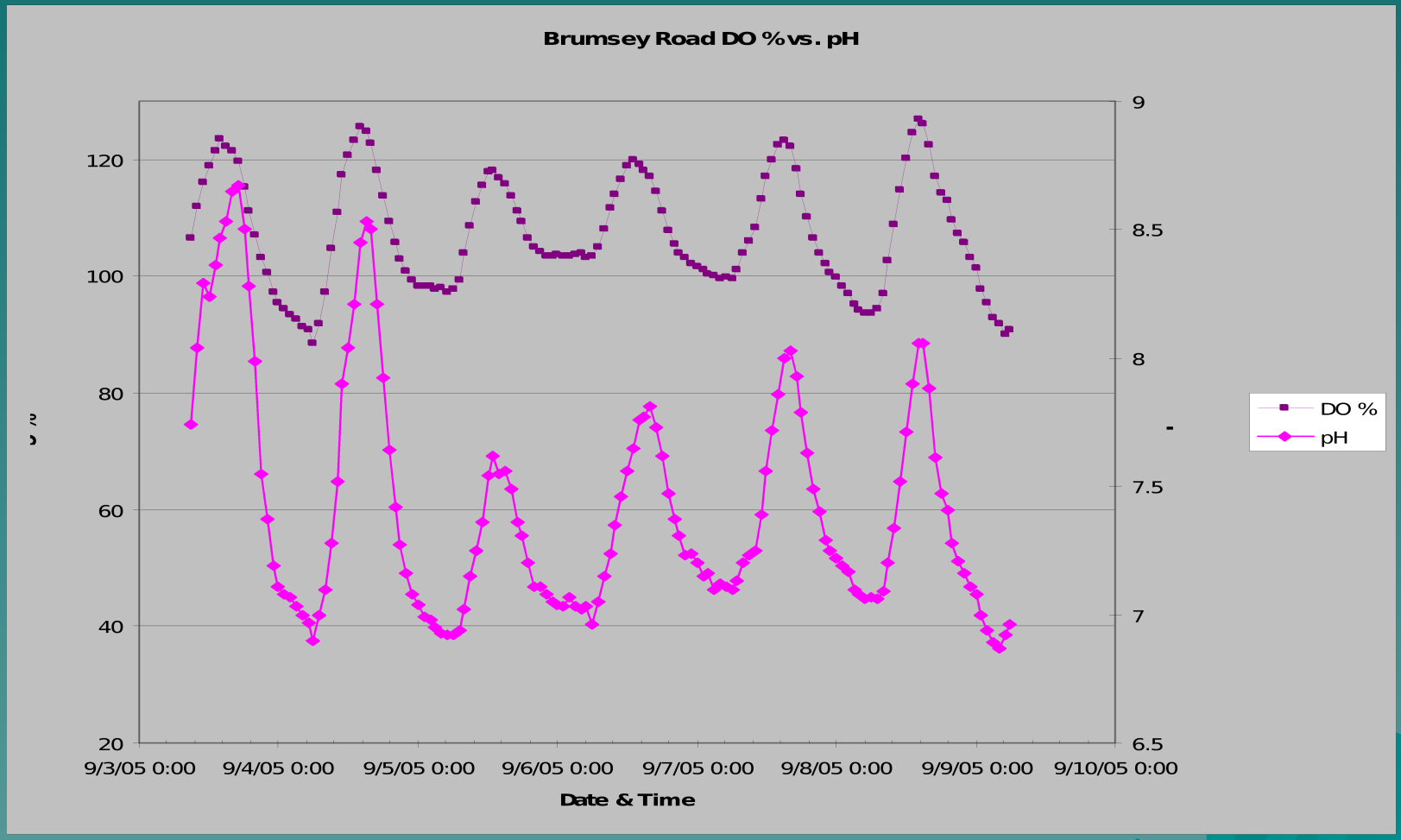
ECSU Participation and Accomplishments To Date

- Flow and discharge training:
  - Received ChannelMaster and Rio Grande last week
  - Completed two on-line training sessions and one in-person training session
  - Will practice with Rio Grande throughout December 2005 and January 2006
  - Will assemble attachment device for ChannelMaster during December 2005 and deploy ChannelMaster at Coinjock Canal site beginning in January 2006

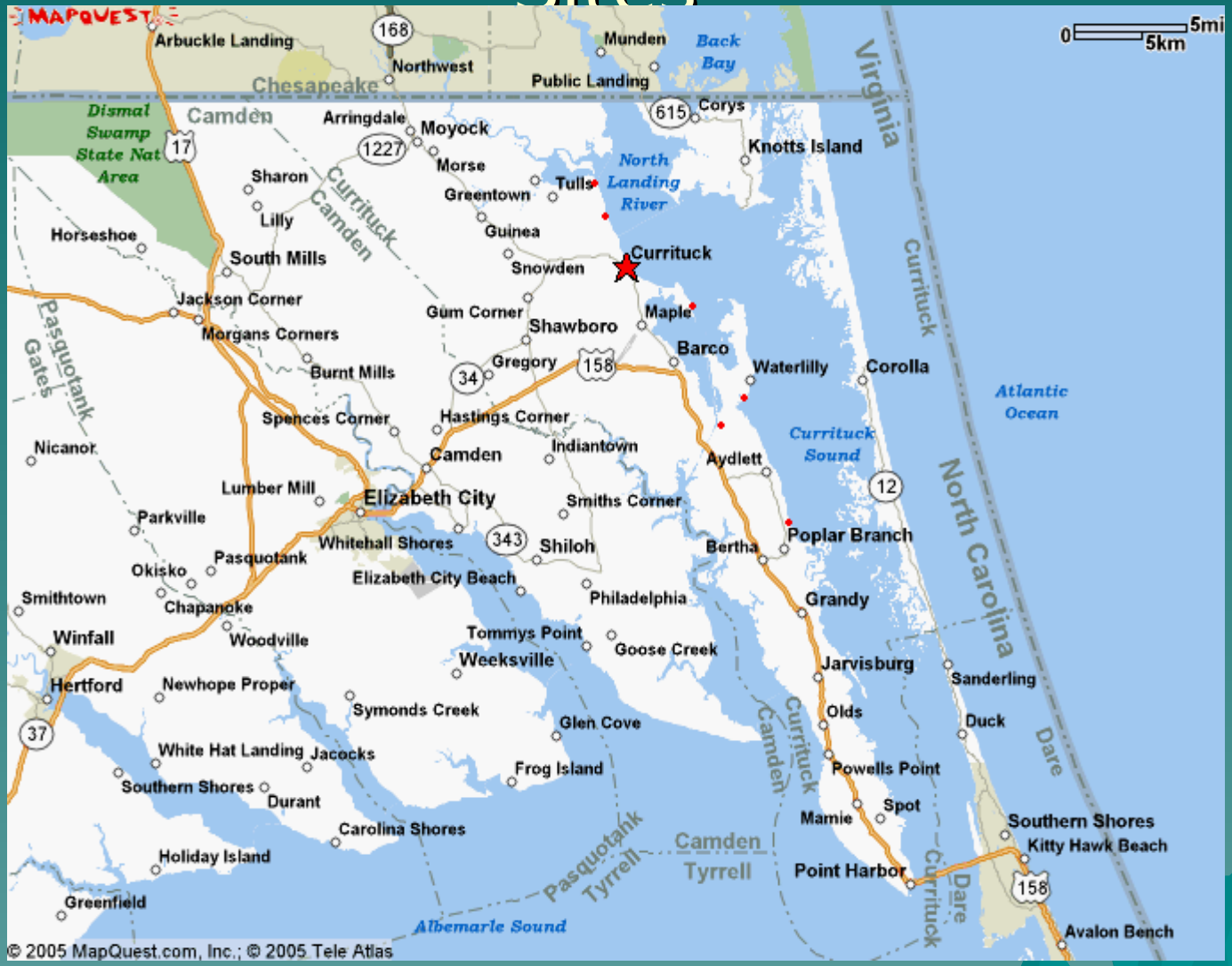
The Currituck Sound Restoration Project Week-Long, In Situ Sampling at Brumsey Road

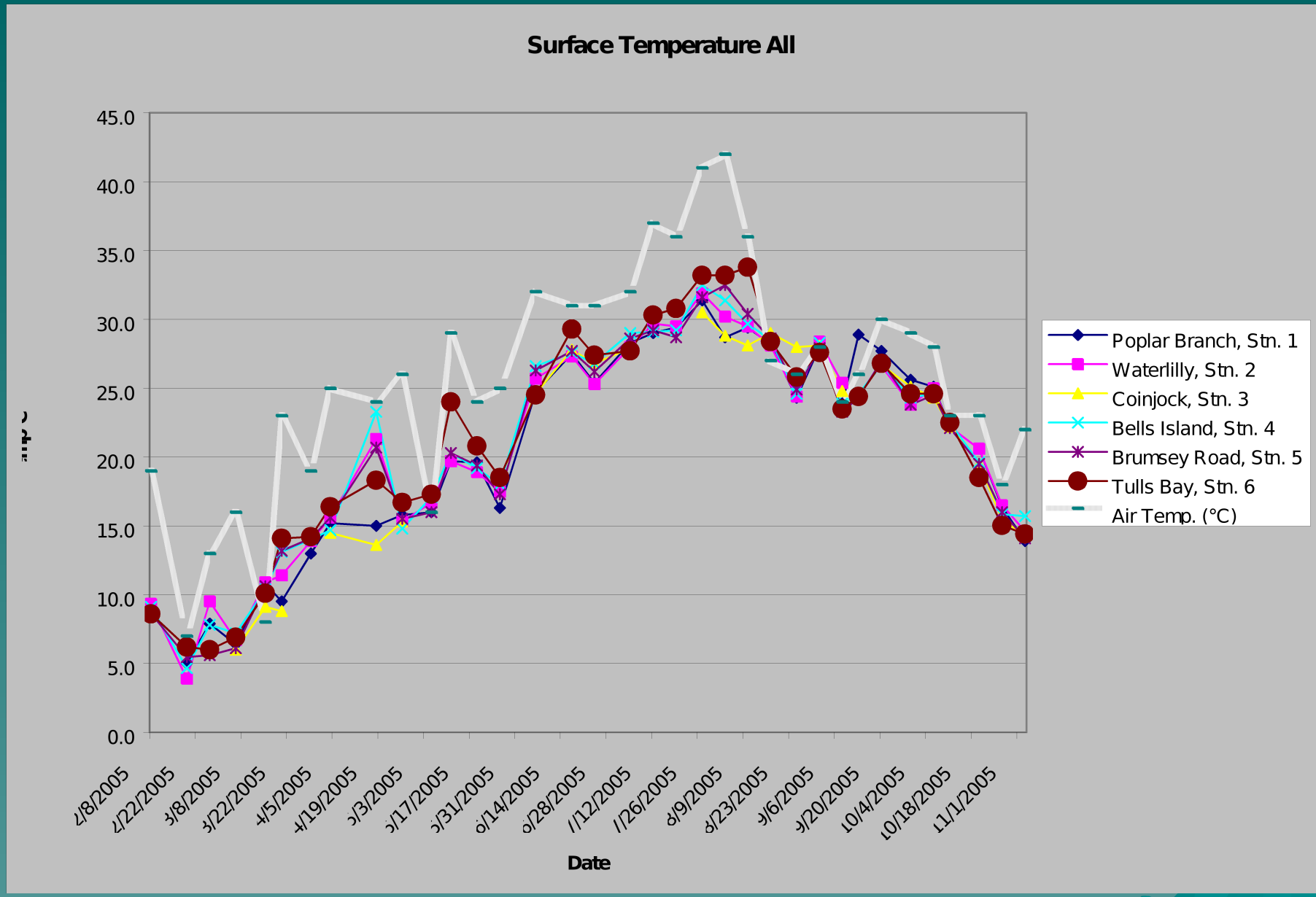


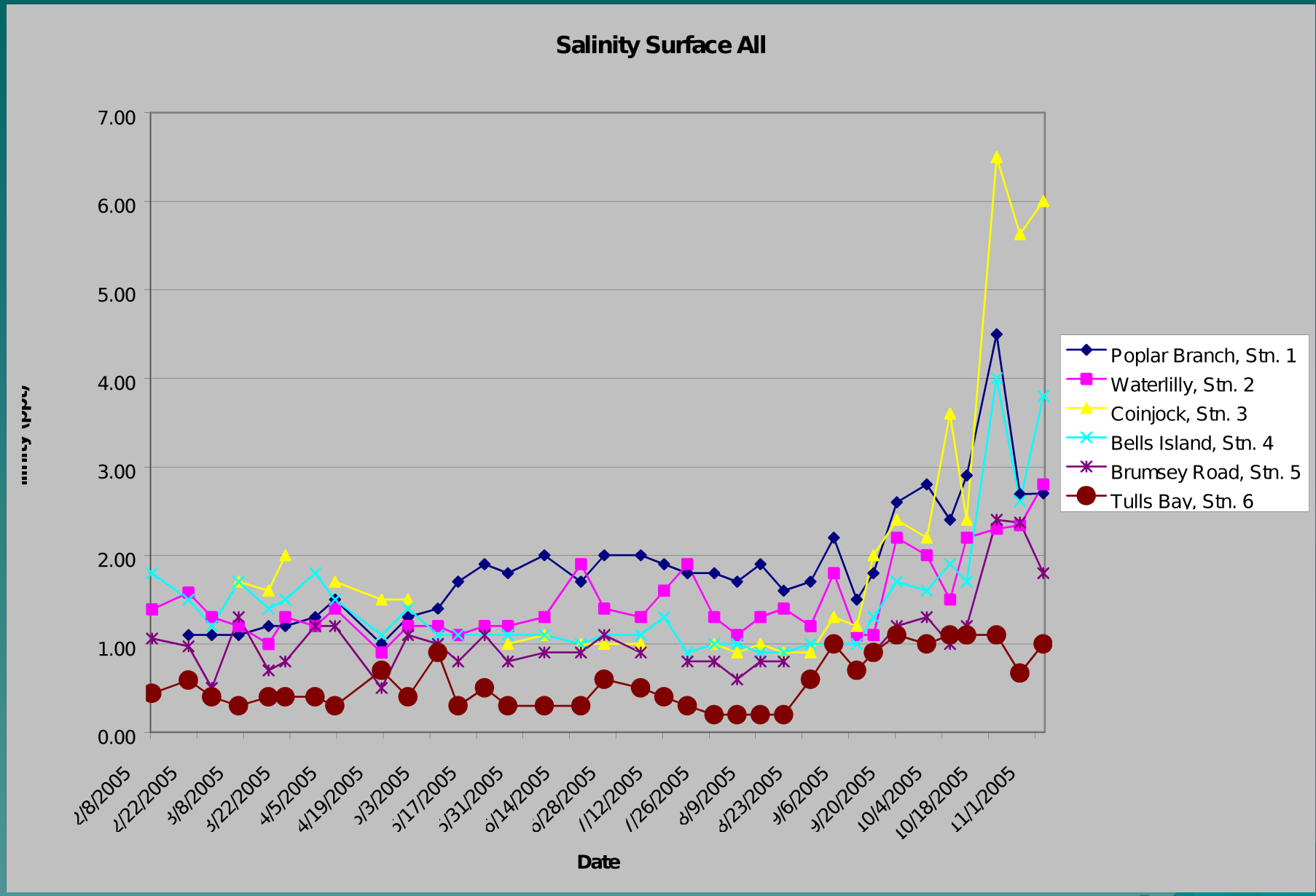
The Currituck Sound Restoration Project Week-Long, In Situ Sampling at Brumsey Road

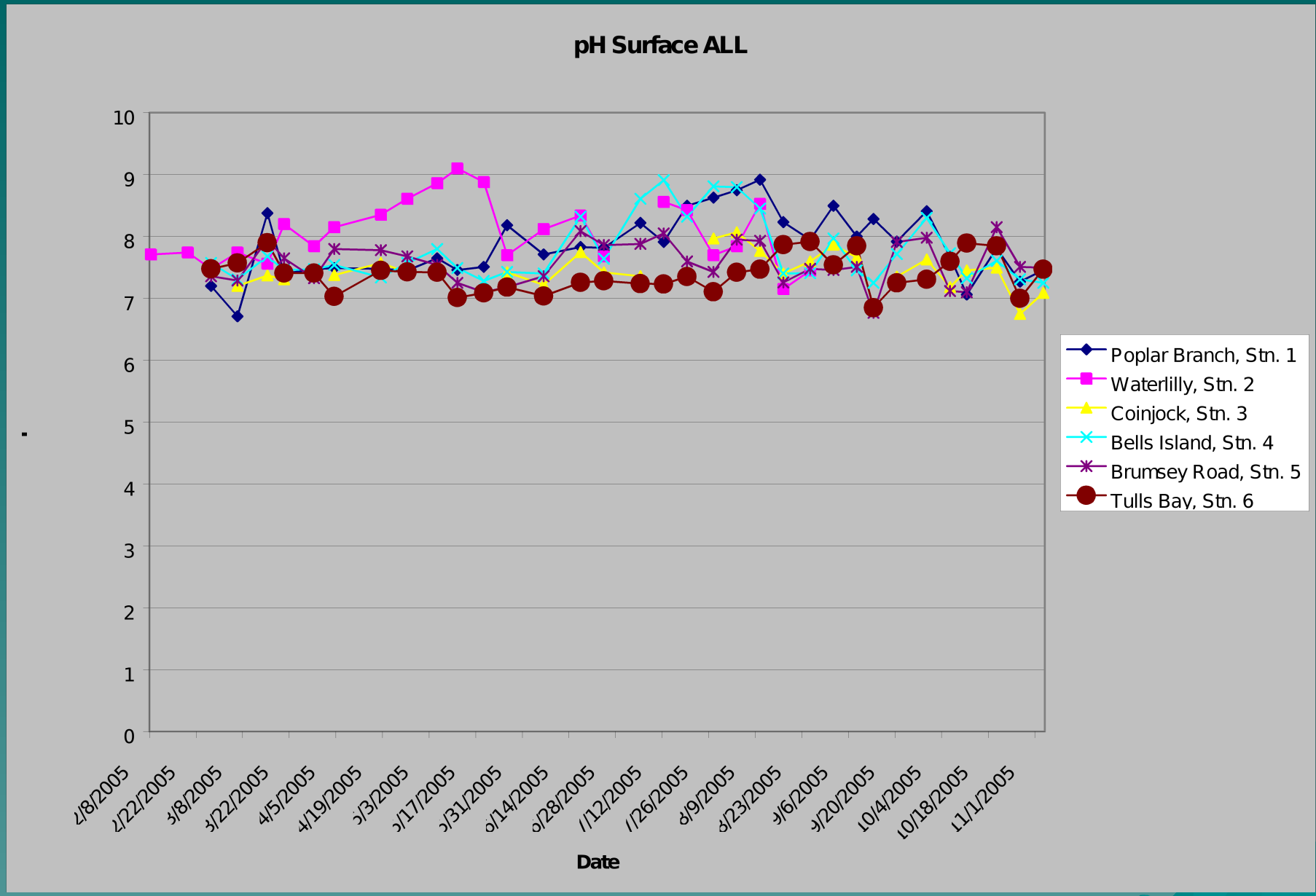


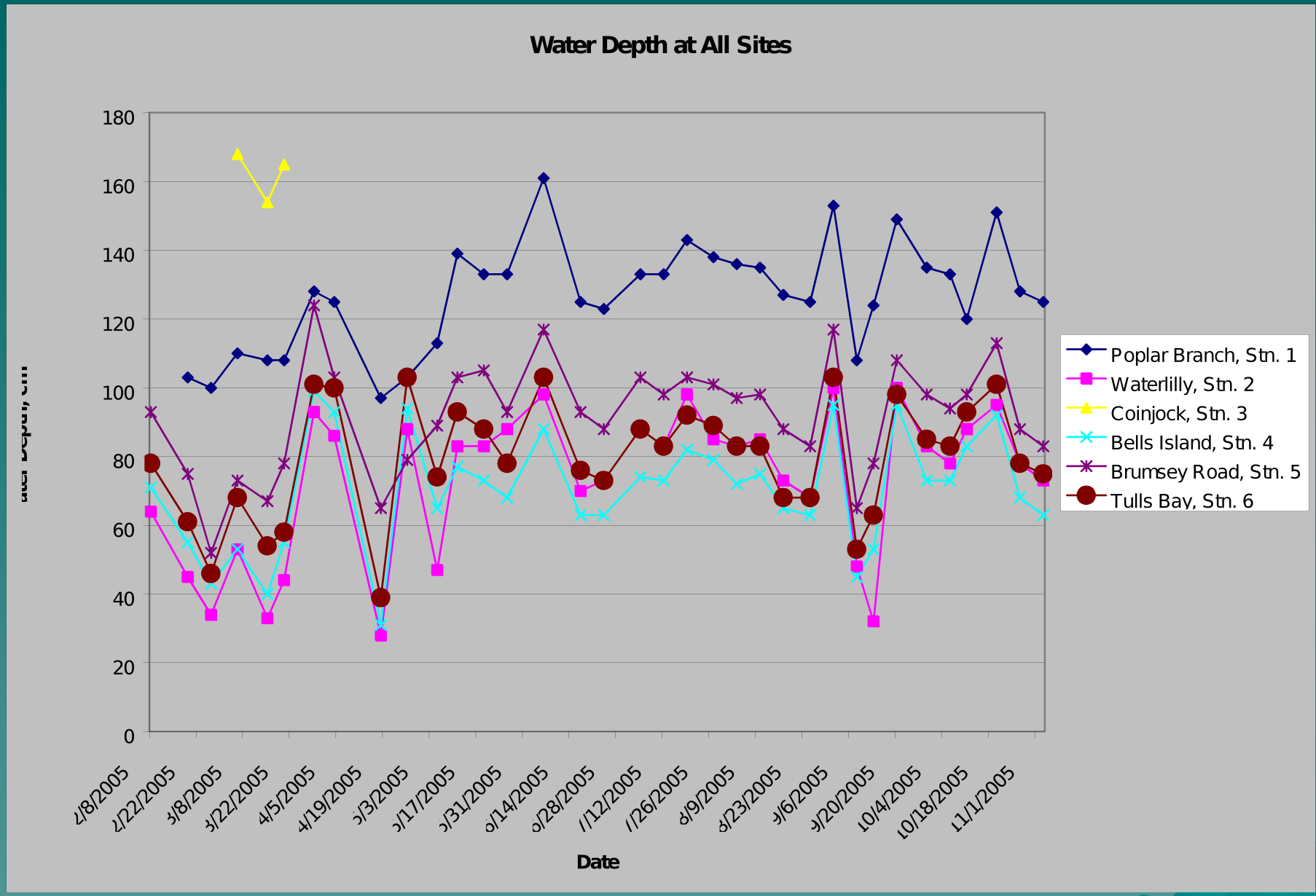
Currituck Sound - ECSU Additional Sites

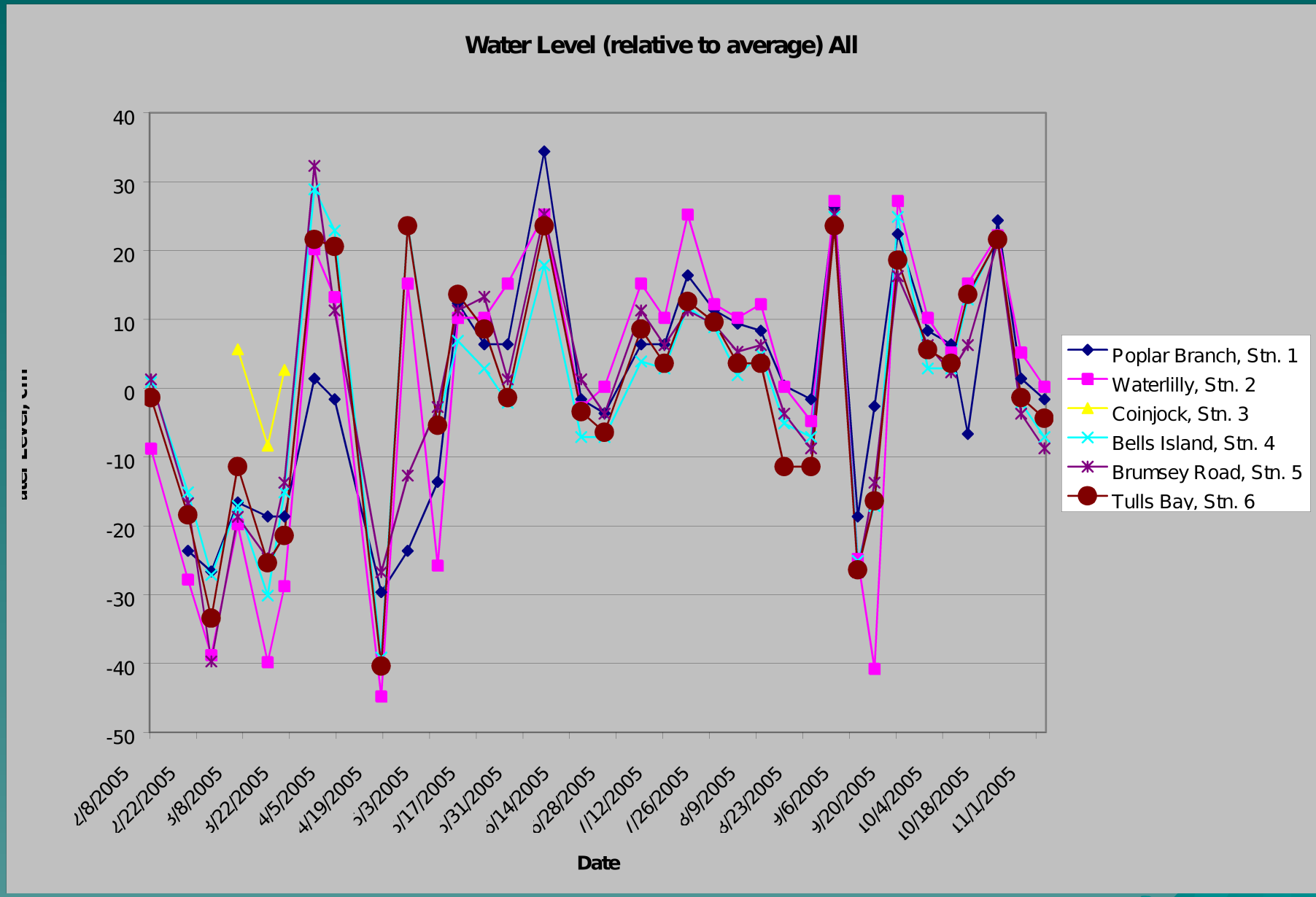


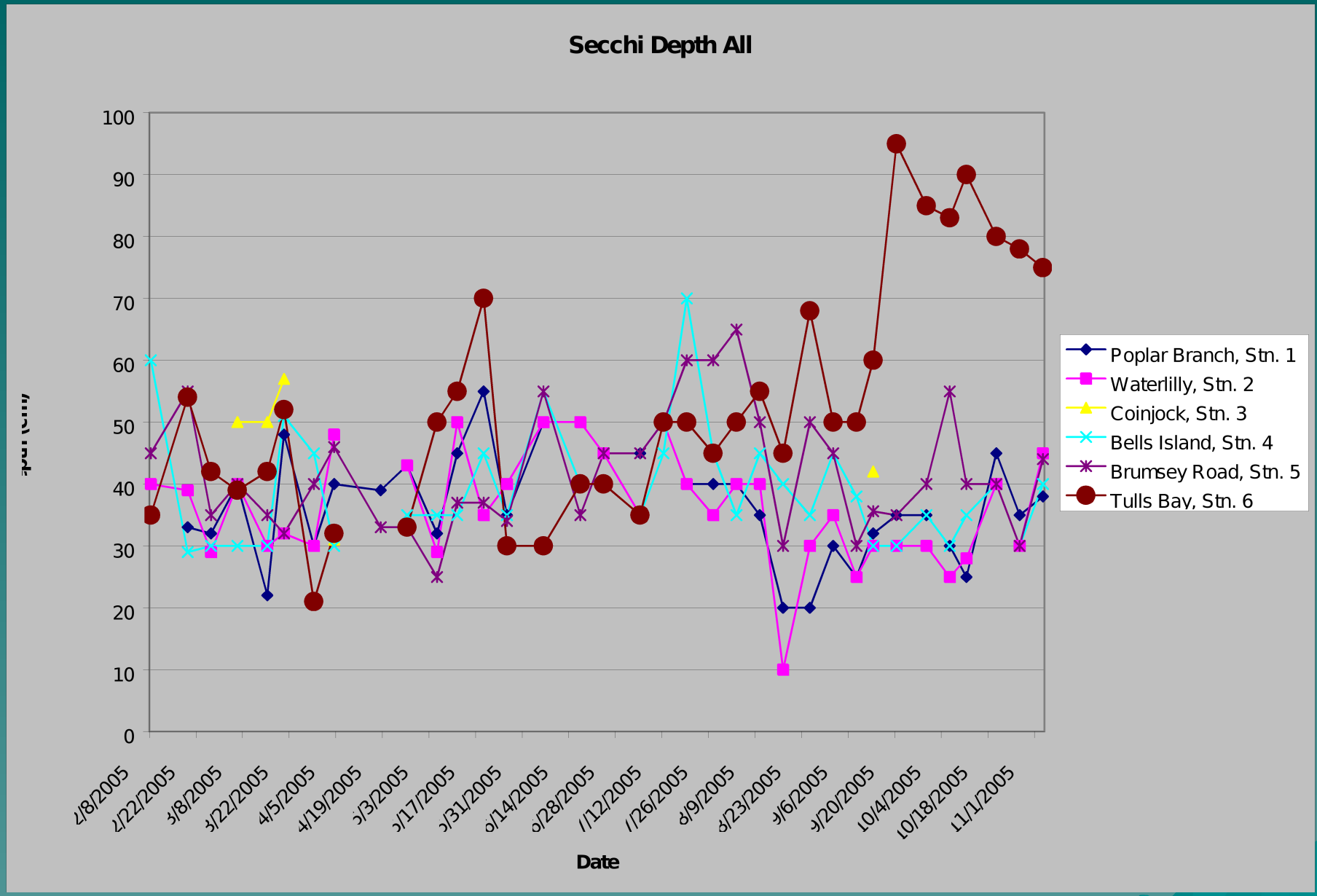

Surface Temperature All
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Date
Poplar Branch, Stn. 1
Waterlilly, Stn. 2
Coinjock, Stn. 3
Bells Island, Stn. 4
Brumsey Road, Stn. 5
Tulls Bay, Stn. 6
Air Temp. (°C)

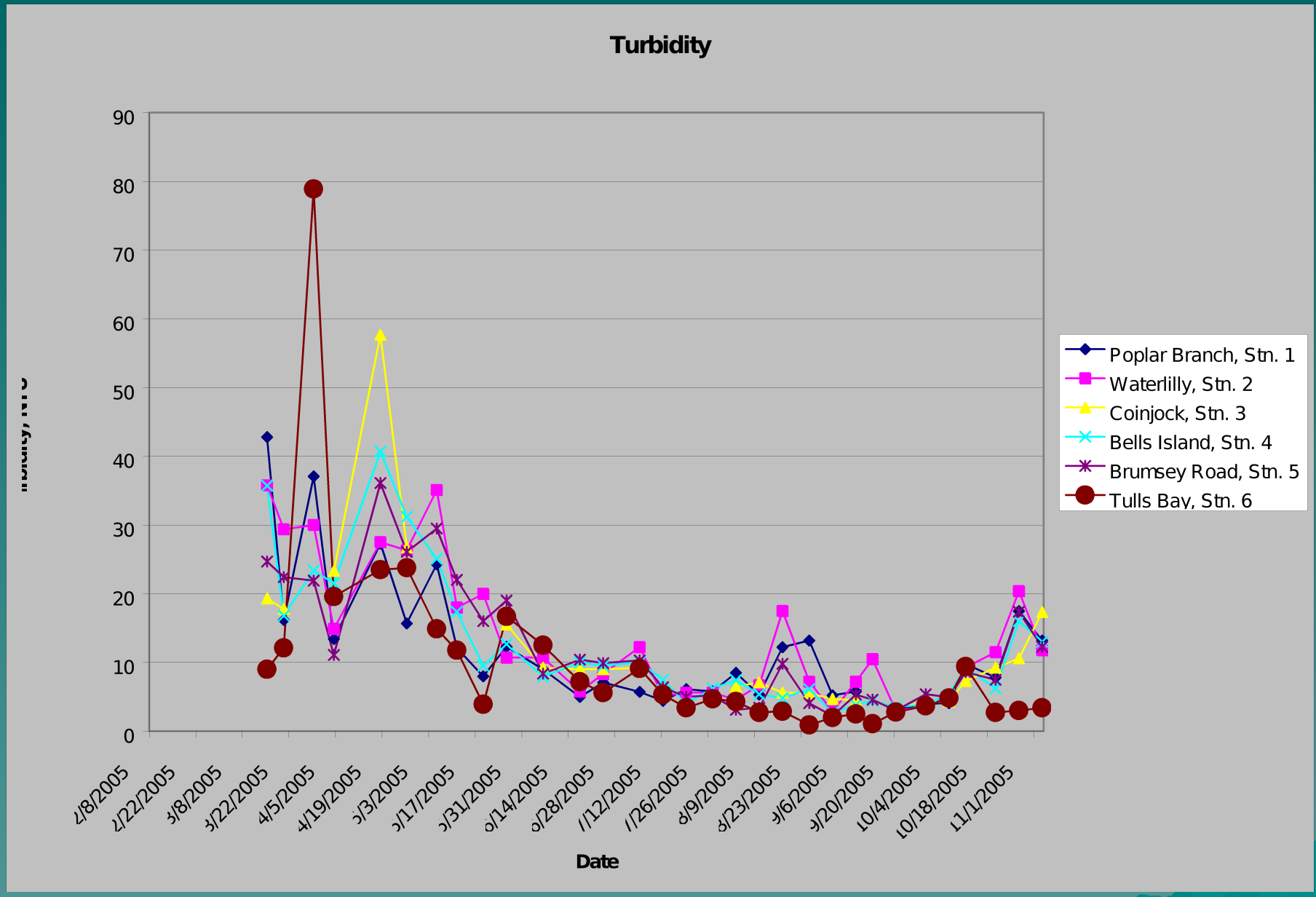

Salinity Surface All
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Poplar Branch, Stn. 1
Waterlilly, Stn. 2
Coinjock, Stn. 3
Bells Island, Stn. 4
Brumsey Road, Stn. 5
Tulls Bay, Stn. 6
Date

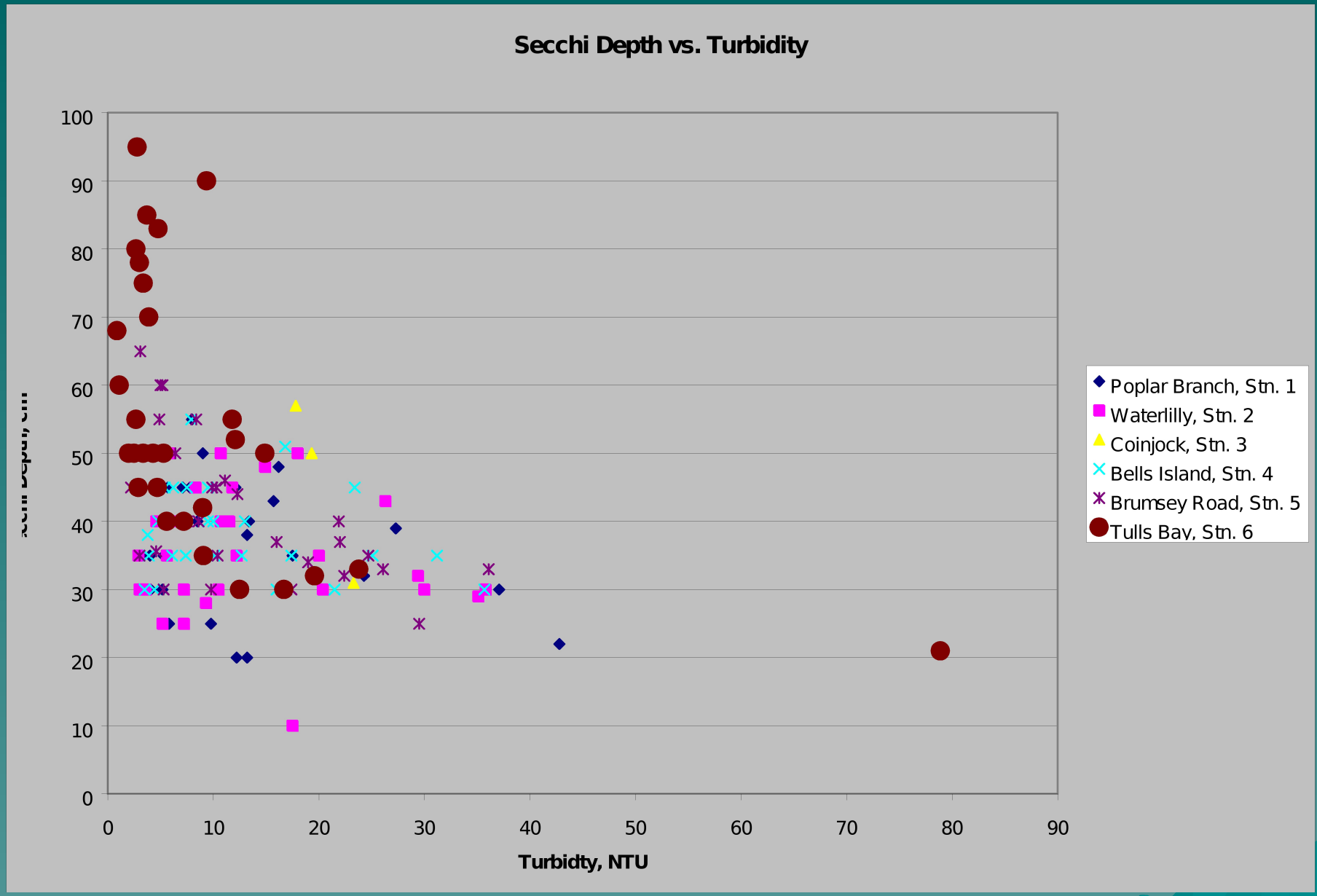

pH Surface ALL
10
9
8
7
6
5
4
3
2
1
0
Date
Poplar Branch, Stn. 1
Waterlilly, Stn. 2
Coinjock, Stn. 3
Bells Island, Stn. 4
Brumsey Road, Stn. 5
Tulls Bay, Stn. 6

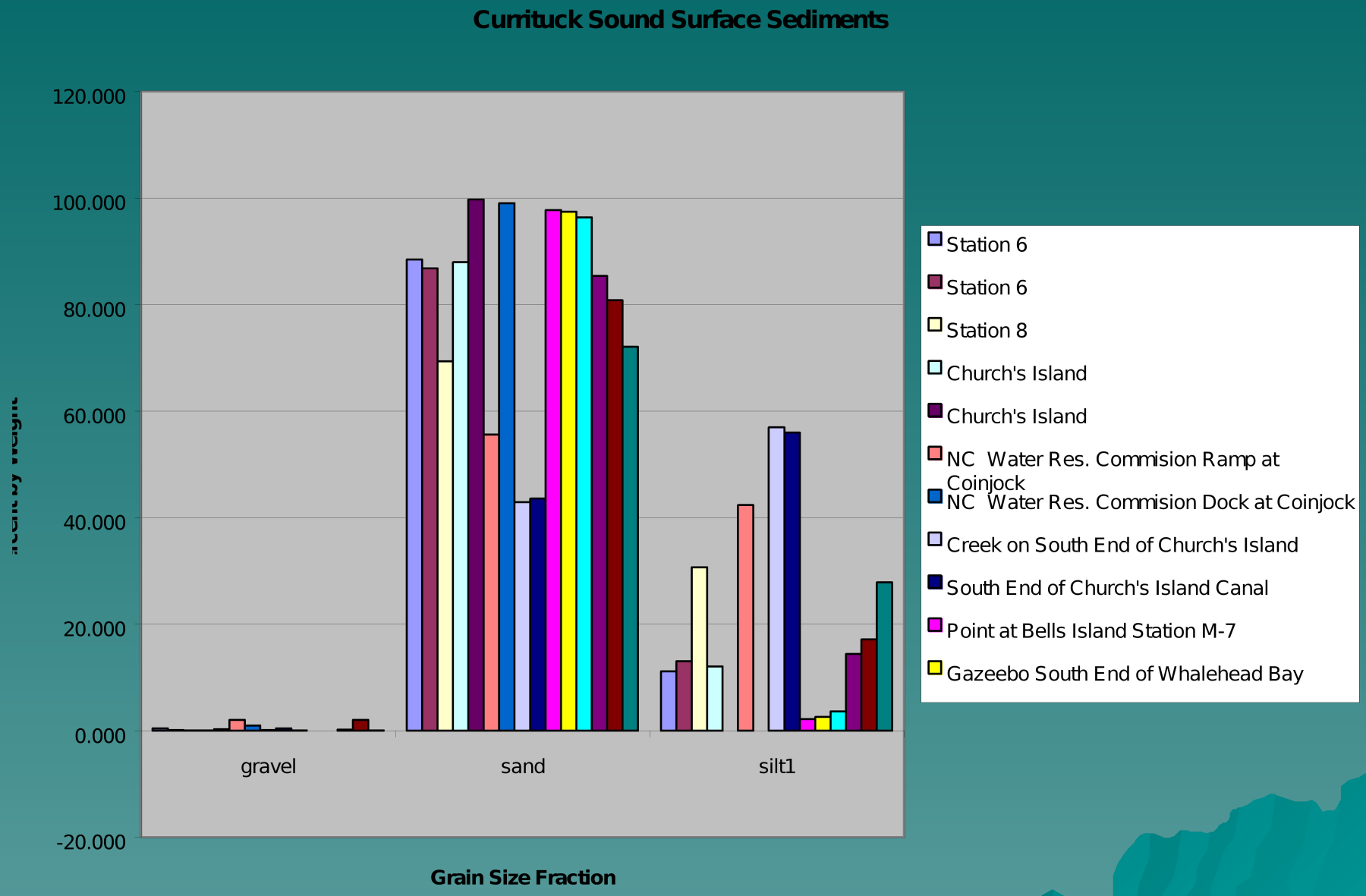

Water Depth at All Sites
180
160
140
120
100
80
60
40
20
0
Date
Poplar Branch, Stn. 1
Waterlilly, Stn. 2
Coinjock, Stn. 3
Bells Island, Stn. 4
Brumsey Road, Stn. 5
Tulls Bay, Stn. 6

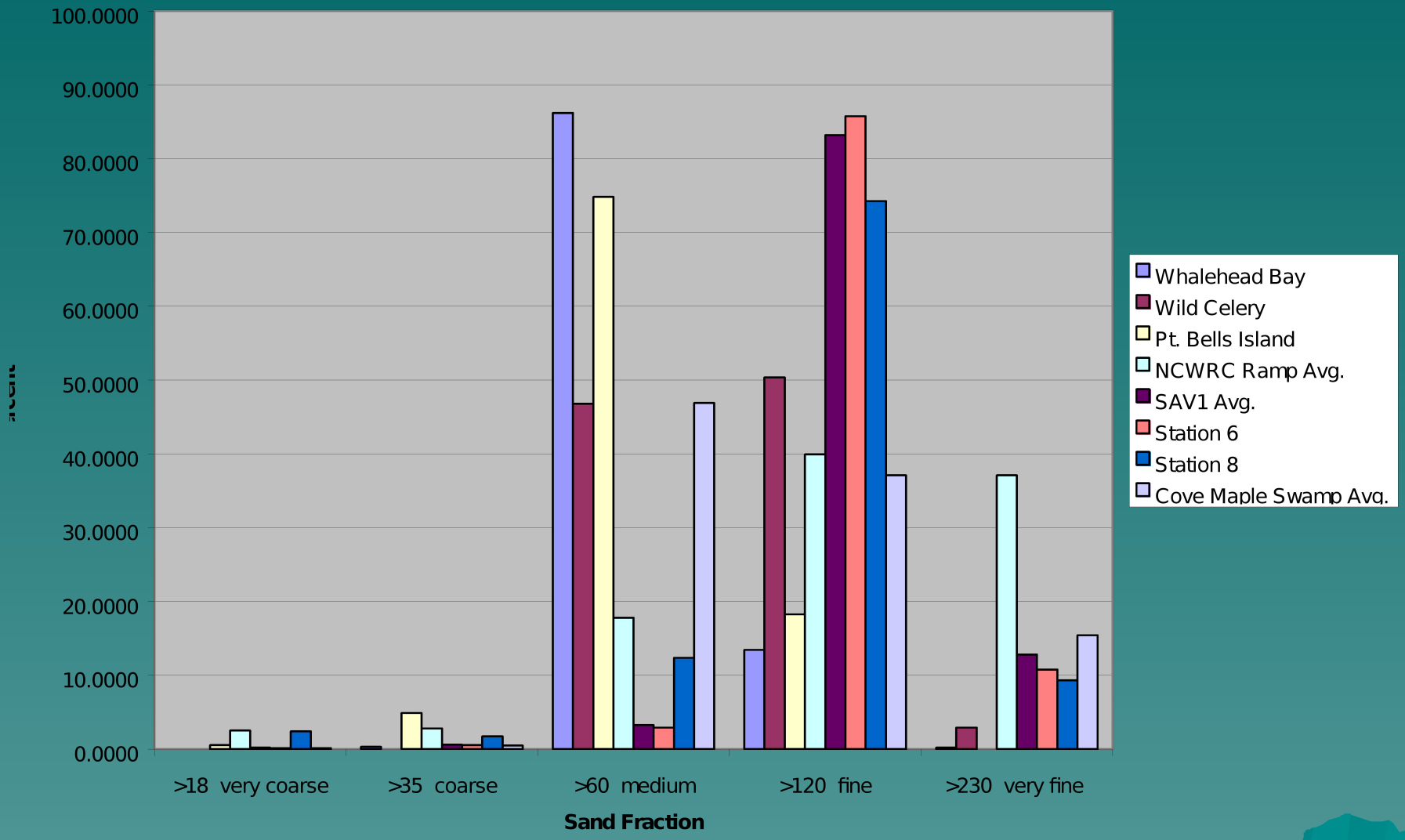

Water Level (relative to average) All
40
30
20
10
0
-10
-20
-30
-40
-50
Date
Poplar Branch, Stn. 1
Waterlilly, Stn. 2
Coinjock, Stn. 3
Bells Island, Stn. 4
Brumsey Road, Stn. 5
Tulls Bay, Stn. 6


Secchi Depth All
100
90
80
70
60
50
40
30
20
10
0
Date
Poplar Branch, Stn. 1
Waterlilly, Stn. 2
Coinjock, Stn. 3
Bells Island, Stn. 4
Brumsey Road, Stn. 5
Tulls Bay, Stn. 6


Turbidity
90
80
70
60
50
40
30
20
10
0
Date
Poplar Branch, Stn. 1
Waterlilly, Stn. 2
Coinjock, Stn. 3
Bells Island, Stn. 4
Brumsey Road, Stn. 5
Tulls Bay, Stn. 6


Secchi Depth vs. Turbidity
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
Turbidty, NTU
Poplar Branch, Stn. 1
Waterlilly, Stn. 2
Coinjock, Stn. 3
Bells Island, Stn. 4
Brumsey Road, Stn. 5
Tulls Bay, Stn. 6


Currituck Sound Surface Sediments
120.000
100.000
80.000
60.000
40.000
20.000
0.000
-20.000
gravel
sand
silt1
Grain Size Fraction
Station 6
Station 6
Station 8
Church's Island
Church's Island
NC Water Res. Commision Ramp at Coinjock
NC Water Res. Commision Dock at Coinjock
Creek on South End of Church's Island
South End of Church's Island Canal
Point at Bells Island Station M-7
Gazeebo South End of Whalehead Bay


Currituck Sound Sands
100.0000
90.0000
80.0000
70.0000
60.0000
50.0000
40.0000
30.0000
20.0000
10.0000
0.0000
>18 very coarse
>35 coarse
>60 medium
>120 fine
>230 very fine
Sand Fraction
Whalehead Bay
Wild Celery
Pt. Bells Island
NCWRC Ramp Avg.
SAV1 Avg.
Station 6
Station 8
Cove Maple Swamp Avg.